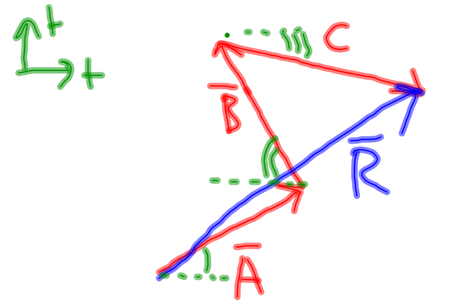
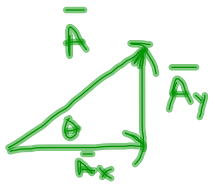
Vector Problem Types:

1. Resultant/Components
2. Hanging Object
3. River
4. Rope pulling object on horizontal surface
5. Incline plane

Vector Notes and Practice Problems 9.29.11

Add the following vectors graphically and algebraically: 10 N at 34 degrees North of East, 15 N at 17 degrees South of East, and 12 N at 55 degrees North of West.



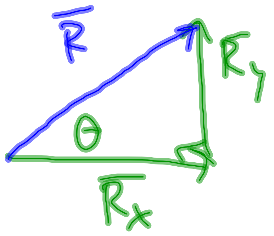


$$A_x = (10\text{ N})\cos(34°) \qquad A_y = (10\text{ N})\sin(34°)$$

$$B_x = -(12\text{ N})\cos(55°) \qquad B_y = (12\text{ N})\sin(55°)$$

$$+\ C_x = (15\text{ N})\cos(17°) \qquad +\ C_y = -(15\text{ N})\sin(17°)$$

$$R_x = 15.8\text{ N} \qquad R_y = 11.0\text{ N}$$



$$\tan\theta = \frac{R_y}{R_x}$$

$$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right) = \tan^{-1}\left(\frac{11.0\text{ N}}{15.8\text{ N}}\right) = 34.8°$$

magnitude unit @ angle direction

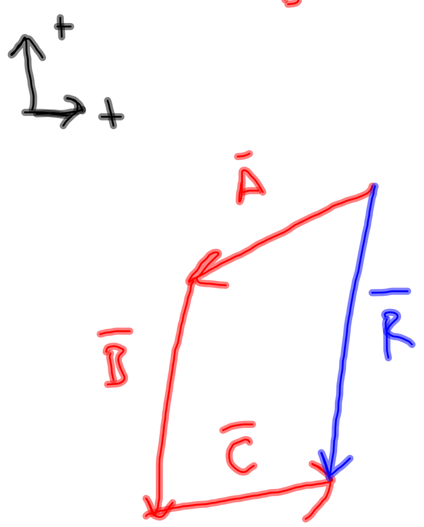
19.2 N @ 34.8° North of East

$$R^2 = R_x^2 + R_y^2$$

$R = 19.2$ N

Vector Notes and Practice Problems 9.29.11

Add the following vectors graphically and algebraically: 44 N at 34 degrees South of West ($\bar{A}$), 50 N at 81 degrees South of West ($\bar{B}$), and 40 N at 10 degrees North of East ($\bar{C}$).

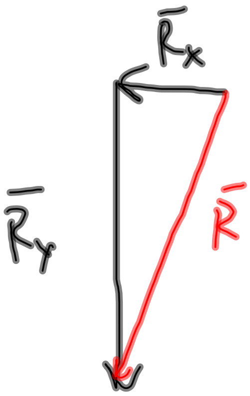


$$A_x = -(44\text{ N})\cos(34°) \qquad A_y = -(44\text{ N})\sin(34°)$$

$$B_x = -(50\text{ N})\cos(81°) \qquad B_y = -(50\text{ N})\sin(81°)$$

$$+\,C_x = (40\text{ N})\cos(10°) \qquad +\,C_y = (40\text{ N})\sin(10°)$$

$$R_x = -4.90\text{ N} \qquad R_y = -67.0\text{ N}$$



$$\theta = \tan^{-1}\left(\frac{67.0\text{ N}}{4.90\text{ N}}\right)$$

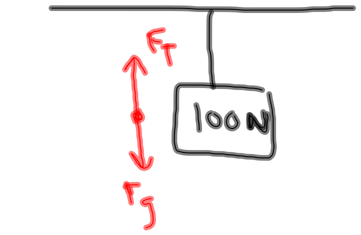
$$= 85.8°$$

$$R = \sqrt{(4.90\text{ N})^2 + (67.0\text{ N})^2}$$

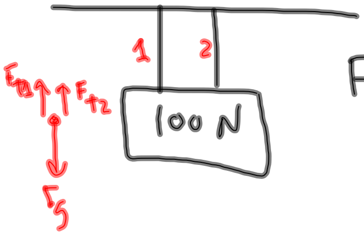
$$= 67.2\text{ N}$$

67.2 N @ 85.8° South of West

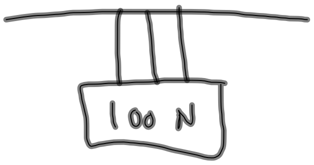
Hanging Objects:



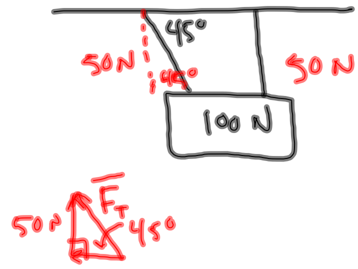
$F_T =$



F_T of each = 50 N



F_T of each = 33.3 N

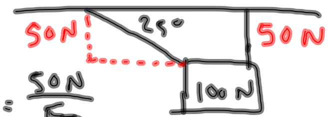


actual tension on strings is no longer equal

$$\sin(45°) = \frac{50\text{ N}}{F_T}$$

$$F_T = \frac{50\text{ N}}{\sin(45°)}$$

$$= 70.7\text{ N}$$



$$\sin(25°) = \frac{50\text{ N}}{F_T}$$

$$F_T = \frac{50\text{ N}}{\sin(25°)}$$

$$= 118\text{ N}$$

A boat travels due east at 8.88 m/s. There is also a 2.2 m/s current south acting on the boat. The river is 55.5 m wide.

a) How long will it take the boat to cross the river?

b) How far downstream will it end up from where it started?

As a boat travels 3.33 m/s due south, there is a current pushing 2.22 m/s at 50 degrees south of east. What is the resultant speed and direction of the boat?